Status of Current and Future Management of the Snapper-Grouper Resource in the South Atlantic

GREGG T. WAUGH
Deputy Executive Director
South Atlantic Fishery Management Council
1 Southpark Circle, Suite 306
Charleston, SC 29406-4699
(803)571-4366; FAX (803)769-4520

ABSTRACT

The South Atlantic Fishery Management Council is responsible for management of the snapper grouper resource in the South Atlantic in federal waters off the states of North Carolina through the Florida East Coast. The original snapper grouper fishery management plan was implemented in 1983 and Amendment 4 is scheduled to be implemented in October, 1991. Amendment 5 will be implemented in early 1992.

The current management program is described and includes minimum sizes, bag limits, quotas, gear restrictions and prohibitions, spawning season limitations, reporting requirements, and prohibitions on harvesting certain species (currently jewfish and Nassau grouper). Future management measures scheduled to be implemented in late 1991 and early 1992 are also described.

KEY WORDS: Snapper grouper, fishery management plan, South Atlantic Fishery Management Council.

INTRODUCTION

The Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (SAFMC, 1983a,b) was prepared by the South Atlantic Fishery Management Council and implemented by the Secretary of Commerce on August 31, 1983 [48 Federal Register 39463]. The Fishery Management Plan was prepared to prevent growth overfishing in thirteen species in the snapper grouper complex and to establish a procedure for preventing overfishing in other species. The Fishery Management Plan established a twelve inch total length minimum size for red snapper, yellowtail snapper, red grouper and Nassau grouper; an eight inch total length minimum size for black sea bass; and a four inch trawl mesh size to achieve a twelve inch minimum size for vermilion snapper. Additional harvest and gear limitations were also included in the original management plan.

Amendment 1 (SAFMC, 1988) was implemented by the Secretary effective January 12, 1989 [54 Federal Register 1720] to address the problems of habitat damage and growth overfishing in the trawl fishery. The amendment prohibits use of trawl gear to harvest fish in the directed snapper grouper fishery south of

Cape Hatteras, North Carolina (35° 15' N Latitude) and north of Cape Canaveral, Florida (Vehicle Assembly Building, 28° 35.1' N Latitude). A vessel with trawl gear and more than 200 pounds of fish in the snapper grouper fishery (as listed in Section 646.2 of the regulations) on board was defined as a directed fishery. The amendment also established a rebuttable presumption that a vessel with fish in the snapper grouper fishery (as listed in Section 646.2 of the regulations) on board harvested its catch of such fish in the Exclusive Economic Zone (EEZ).

Amendment 2 (SAFMC, 1990a) prohibited the harvest or possession of jewfish in or from the exclusive economic zone in the South Atlantic due to its overfished status and defined overfishing for jewfish and other snapper grouper species according to the 602 guidelines requirement that definitions of overfishing be included for each fishery management plan. The harvest or possession of jewfish was prohibited by emergency rule. The amendment was approved on October 10, 1990 and final regulations were effective October 30, 1990 [55 Federal Register 46213].

Amendment 3 (SAFMC, 1990b) established a management program for the recently developed wreckfish fishery. The Council was concerned that the rapid increase in effort and catch threatens the wreckfish resource with overfishing and that the concentration of additional vessels in the relatively small area where the resource is located also could create problems with vessel safety because of overcrowding. Actions included: (1) adding wreckfish to the management unit; (2) defining optimum yield; (3) defining overfishing for wreckfish; (4) requiring an annual permit to fish for, land or sell wreckfish; (5) collecting data necessary for effective management; (6) establishing a control date of March 28, 1990 after which there would be no guarantee of inclusion in a limited entry program should one be developed (this was later limited to the area bounded by 33° and 30° N Latitude based on input from public hearings); (7) establishing a fishing year beginning April 16; (8) establishing a process whereby annual total allowable catch (annual quotas) would be specified with the initial quota being two million pounds; (9) establishing a 10,000 pound trip limit; and (10) establishing a spawning season closure from January 15 through April 15. Actions (7), (9) and (10) were based on public input at meetings and hearings. An emergency rule effective August 3, 1990 [55 Federal Register 32257] added wreckfish to the management unit, established a fishing year for wreckfish commencing April 16, 1990, established a commercial quota of two million pounds and established a catch limit of 10,000 pounds per trip. The Secretary closed the fishery for wreckfish in the EEZ effective August 8, 1990, based on the TAC of two million pounds being reached [55 Federal Register 32635]. The Council requested an extension of the emergency rule which was approved [55 Federal Register 40181]. Amendment 3 was approved on November 9, 1990 and final regulations were effective January 31, 1991 [56 Federal Register 2443].

Amendment 4 (SAFMC, 1991a) was prepared to reduce fishing mortality on overfished species, to establish compatible regulations, where possible, between state and federal agencies, to identify the universe of fisherman, and to gather the data necessary for management. Amendment 4 prohibits: (1) use of fish traps in the South Atlantic federal waters with the exception of black sea bass traps when used north of Cape Canaveral, Florida; (2) use of entanglement nets, which includes gill and trammel nets; (3) use of longline gear inside 50 fathoms (300 feet) in the snapper and grouper fishery in South Atlantic federal waters; (4) use of bottom longlines for wreckfish; and (5) use of powerheads and bangsticks in all designated special management zones (SMZs) off the South Carolina coast. In addition, fishermen who fish for other species with gear prohibited in the snapper-grouper fishery may not have bycatches of snapper and grouper species in excess of the allowed bag limit. No bycatch would be allowed for those species that have no bag limit or that are prohibited. The Amendment establishes the following minimum sizes: eight inch total length for lane snapper and black sea bass; ten inch total length for vermilion snapper (recreational fishery only); twelve inch total length for red porgy, vermilion snapper (commercial fishery only), gray, yellowtail, mutton, schoolmaster, queen, blackfin, cubera, dog, mahogany and silk snappers; twenty inch total length for red snapper, gag, and red, black, scamp, yellowfin, and yellowmouth groupers; 28 inch fork length for greater amberjack (recreational fishery only); 36 inch fork length or 28 inch core length for greater amberjack (commercial fishery only); and no retention of Nassau grouper. Amendment 4 also requires that all snappers and groupers possessed in South Atlantic federal waters must have head and fins intact through landing. Bag limits that are established under Amendment 4 for the recreational fishery are: a bag limit of ten vermilion snapper per person per day; a bag limit of three greater amberjack per person per day; a snapper aggregate bag limit of ten fish per person per day, excluding vermilion snapper and allowing no more than two red snappers; and a grouper aggregate bag limit of five per person per day, excluding Nassau grouper and jewfish. Under the Amendment, charter and headboats are allowed to have up to a two-day possession limit as long as there are two licensed operators on board and passengers have receipts for trips in excess of twelve hours. Excursion boats would be allowed to have up to a three-day possession limit on multi-day trips. Fish harvested under the bag limit may be sold in conformance with state laws if they meet the commercial minimum sizes. The commercial harvest and/or landing of greater amberjack in excess of the three-fish bag limit is prohibited in April south of Cape Canaveral, Florida. The commercial harvest and/or landing of mutton snapper in excess of the snapper aggregate bag limit is prohibited during May and June. To exceed bag limits in the snapper-grouper fishery, an owner or operator of a vessel that fishes in South Atlantic federal waters is

required to obtain an annual vessel permit. For individuals to qualify for a permit they must have at least 50% of their earned income, or $20,000 in gross sales, derived from commercial, charter, or headboat fishing. For a corporation to be eligible for a permit, the corporation or a shareholder or officer of the corporation or the vessel operator would be required to have at least $20,000 in gross sales derived from commercial fishing. For partnerships, the general partner or operator of the vessel is required to meet the same qualifications as a corporation. A permit, gear, vessel and trap identifications are required to fish with black sea bass traps. Amendment 4 also addresses enforcement concerns that surfaced with the wreckfish trip limit. Amendment 4 was approved on August 26, 1991 by the Secretary of Commerce and all regulations will go into effect January 1, 1992 except the bottom longline prohibition for wreckfish that will be effective October 17, 1991.

Bottom longline gear was being used to a limited extent in the wreckfish fishery and input from fishermen indicated that the loss of gear, damage to habitat and lost gear continuing to fish was a problem. The Council subsequently requested and was granted emergency regulations [56 FR 18742] that prohibit the use of bottom longline gear in the wreckfish fishery effective April 19, 1991 and were granted an extension on July 19, 1991 [56 FR 33210].

The wreckfish fishery is currently under a three million pound TAC for fishing year 1991. That TAC will be released in one million pound units, the first on April 16, 1991, the second on July 16, 1991, and the third on October 16, 1991. Release of the third one million pound unit is contingent upon the finding that the index of catch per unit effort (CPUE) and mean size of wreckfish do not show a significant decline over the first two harvest periods, and other information available does not indicate concern about the status of the wreckfish resource.

A control date of July 30, 1991 for possible future limited entry was established for the entire snapper grouper fishery excluding wreckfish [56 FR 36052].

Amendment 5 (SAFMC, 1991b) established an Individual Transferable Quota (ITQ) management program for the wreckfish fishery. The Council submitted the amendment to the Secretary of Commerce on September 12, 1991. Amendment 5 would: (1) establish a limited entry program for the wreckfish sector of the snapper grouper fishery consisting of transferable percentage shares of the annual total allowable catch (TAC) of wreckfish and individual transferable quotas (ITQs) based on a person's share of each TAC; (2) require dealer permits to receive wreckfish; (3) remove the 10,000-pound (4,536-kilogram) trip limit for wreckfish; (4) require that wreckfish be off-loaded from fishing vessels only between 8:00 a.m. and 5:00 p.m.; (5) reduce the occasions when 24-hour advance notice must be made to NMFS Law Enforcement concerning off-loading of wreckfish; and (6) specify the

procedure for initial distribution of percentage shares of the wreckfish TAC.

FMP PROBLEMS

The problems of the Snapper Grouper Fishery Management Plan (FMP) as modified by Amendment 4 (SAFMC, 1991a) are:

1. Excessive fishing mortality is jeopardizing the biological integrity of the snapper grouper resource of the South Atlantic. First, thirteen species in the complex are in a documented state of overfishing, *i.e.*, spawning stock ratio (SSR) is less than 30%. This group consists of black sea bass, gray snapper, vermilion snapper, red snapper, red porgy, gray triggerfish, gag, scamp, red grouper, speckled hind, snowy grouper, warsaw grouper, and greater amberjack. Second, fourteen species are thought to be overfished even though the SSRs are unknown. This group consists of golden tilefish, yellowedge grouper, misty grouper, Nassau grouper, black grouper, yellowmouth grouper, yellowfin grouper, schoolmaster snapper, queen snapper, blackfin snapper, cubera snapper, dog snapper, mahogany snapper and silk snapper. Third, the jewfish resource is thought to be severely overfished throughout the Gulf of Mexico and South Atlantic even thought the SSR is unknown. Fourth, the rapid increase in number of vessels, effort, and catch in the newly developed wreckfish fishery threatens the wreckfish resource with overfishing even though the SSR is unknown. Fifth, additional species may be overfished or likely to experience overfishing in the near future.

2. Adequate management has been hindered by lack of current and accurate biological, statistical, social, and economic information. Data necessary to document growth and/or recruitment overfishing, and to calculate SSRs are very limited. Since the universe of participants is unknown, scientists are unable to estimate catch, effort, and other important information with desired accuracy. The present system of fishery dependent and fishery independent data collection provides limited information for assessment purposes and practically no economic or social data.

3. Intense competition exists among recreational, part-time, and full-time commercial users of the snapper grouper resources; and between commercial users employing different gears (hook and line, traps, entanglement nets, longlines, and powerheads/bang sticks).

4. Habitat degradation caused by some types of fishing gear and poor water quality have adversely affected fish stocks and associated habitat.

5. The existence of inconsistent State and Federal regulations makes it difficult to coordinate, implement and enforce management measures and may lead to overfishing. Inconsistent management measures create public confusion and hinders voluntary compliance.

The following problems were added in Amendment 5 (SAFMC, 1991b):

1. Excess Capacity: The size and capacity of the wreckfish fleet exceeds that needed for present TAC as well as the range of TACs the Council is likely

to approve in the foreseeable future. Additional vessels in the future would exacerbate this situation since the derby nature of an open access fishery encourages fishermen to add harvest capacity even when gains in production are marginal or when economies of scale are not necessarily realized.

2. Inefficiency: Past and present measures to control harvest (TAC, gear restrictions, trip limits) and future measures that would likely be needed under continued open access, increase fishing costs and decrease potential consumer and producer benefits from the fishery.

3. Low Conservation and Compliance Incentives: Under open access, incentives to promote conservation and voluntary compliance with regulations are low because the benefits from doing so may be appropriated by other fishermen or new entrants.

4. Potential Conflicts: Competitive fishing conditions may eventually lead to gear and area conflicts as a large number of vessels compete for available TAC.

5. High Regulatory Costs: Management and enforcement costs are unnecessarily high and are expected to increase under open access as the number of vessels increases and stricter management measures are needed to control excess fishing effort.

6. Low Marketing Incentives: Efforts by fish dealers to augment consumer acceptance of wreckfish have been thwarted by short-run oversupply and lack of product continuity. The likelihood of additional harvest restrictions under open access increases uncertainty and instability and discourages long-run planning and investment by dealers.

FMP OBJECTIVES

The management objectives of the Snapper Grouper Fishery Management Plan as modified by Amendment 4 (SAFMC, 1991a) are:

1. Prevent overfishing in all species by maintaining the spawning stock ratio (SSR) at or above target levels.

2. Collect necessary data to develop, monitor, and assess biological, economic, and social impacts of management measures designed to prevent overfishing, obtain desired SSR levels, and address the other stated problems.

3. Promote orderly utilization of the resource.

4. Provide for a flexible management system that minimizes regulatory delays while retaining substantial Council and public involvement in management decisions, and rapidly adapts to changes in resource abundance, new scientific information, and changes in fishing patterns among user groups.

5. Minimize habitat damage due to direct and indirect effects of recreational and commercial fishing activities.

6. Promote public comprehension of, voluntary compliance with, and enforcement of the management measures.

The following limited entry objectives were added in Amendment 5 (SAFMC, 1991b):

1. Develop a mechanism to vest fishermen in the wreckfish fishery and create incentives for conservation and regulatory compliance whereby fishermen can realize potential long-run benefits from efforts to conserve and manage the wreckfish resource.

2. Provide a management regime which promotes stability and facilitates long-range planning and investment by harvesters and fish dealers while avoiding, where possible, the necessity for more stringent management measures and increasing management costs over time.

3. Develop a mechanism that allows the marketplace to drive harvest strategies and product forms in order to maintain product continuity and increase total producer and consumer benefits from the fishery.

4. Promote management regimes that minimize gear and area conflicts among fishermen.

5. Minimize the tendency for over-capitalization in the harvesting and processing/distribution sectors.

6. Provide a reasonable opportunity for fishermen to make adequate returns from commercial fishing by controlling entry so that returns are not regularly dissipated by open access, while also providing avenues for fishermen not initially included in the limited entry program to enter the program.

Although not an explicit objective at this time, the Council believes that portions or all of management and administrative costs should be recovered from those who hold individual quota shares in the wreckfish fishery, should recovery of those costs become permissible under future Magnuson Act (MFCMA) revisions. Those costs, or portions of them, would be recovered through such means as transfer fees or ad valorem taxes or other means available.

DESCRIPTION OF FISHERY AND UTILIZATION PATTERNS

Amendment 3 (SAFMC, 1990b) and the Updated Source Document (SAFMC, in prep.) contain additional information on the fishery and utilization patterns. Table 1 lists species in the management unit according to our knowledge about their spawning stock ratios.

Commercial Fishery

In general, total landings, mean size of fish captured, and nominal catch per trip in the commercial fishery have declined substantially. Also, the commercial sector has shifted offshore and changed target species as traditional species became less abundant. In addition, the commercial fishery developed with relatively inefficient hook-and-line gear and then switched to more efficient

Table 1. Species in the management unit grouped according to knowledge about SSR.

SNAPPERS - Lutjanidae
SSR Estimates Available
Lane - *Lutjanus synagris*
Yellowtail - *Ocyurus chrysurus*
Gray - *Lutjanus griseus*

Mutton - *Lutjanus analis*
Vermilion - *Rhomboplites aurorubens*
Red - *Lutjanus campechanus*
SSR Estimates Unavailable
Black - *Apsilus dentatus*
Queen - *Etelis oculatus*
Schoolmaster - *Lutjanus apodus*
Blackfin - *Lutjanus buccanella*
Cubera - *Lutjanus cyanopterus*
Mahogany - *Lutjanus mahogoni*
Dog - *Lutjanus jocu*
Silk - *Lutjanus vivanus*

SEA BASSES - Serranidae
SSR Estimates Available
Black sea bass - *Centropristis striata*
SSR Estimates Unavailable
Bank sea bass - *Centropristis ocyurus*
Rock sea bass - *Centropristis philadelphica*

GROUPERS – Serranidae
SSR Estimates Available
Blue runner - *Caranx crysos*
Gag - *Mycteroperca microlepis*
Scamp - *Mycteroperca phenax*
Red grouper - *Epinephelus morio*
Black grouper - *Mycteroperca bonaci*
Speckled hind* - *E. drummondhayi*
Snowy grouper* - *Epinephelus niveatus*
Warsaw grouper* - *Epinephelus nigritus*
SSR Estimates Unavailable
Rock hind - *Epinephelus adscensionis*
Graysby - *Epinephelus cruentatus*
Yellowedge grouper* - *Epinephelus flavolimbatus*
Coney - *Epinephelus fulva*
Red hind - *Epinephelus guttatus*
Jewfish - *Epinephelus itajara*
Misty grouper* - *Epinephelus mystacinus*

PORGIES - Sparidae
SSR Estimates Available
Red - *Pagrus pagrus*
SSR Estimates Unavailable
Sheepshead - *Archosargus probatocephalus*
Grass - *Calamus arctifrons*
Jolthead - *Calamus bajonado*
Saucereye - *Calamus calamus*
Whitebone - *Calamus leucosteus*
Knobbed - *Calamus nodosus*
Longspine - *Stenotomus caprinus*
Scup - *Stenotomus chrysops*

TRIGGERFISHES - Balistidae
SSR Estimates Available
Gray triggerfish - *Balistes capriscus*
SSR Estimates Unavailable
Queen triggerfish - *Balistes vetula*
Ocean triggerfish - *Canthidermis sufflamen*

JACKS – Carangidae
SSR Estimates Available
Greater amberjack - *Seriola dumerili*
SSR Estimates Unavailable
Yellow jack - *Caranx bartholomaei*
Bar jack - *Caranx ruber*
Almaco jack - *Seriola rivoliana*
Lesser amberjack - Seriola fasciata
Crevalle jack - *Caranx hippos*
Banded rudderfish - *Seriola zonata*

Nassau grouper - *Epinephelus striatus*
Yellowmouth grouper - *Mycteroperca interstitialis*
Tiger grouper - *Mycteroperca tigris*
Yellowfin grouper - *Mycteroperca venenosa*
Wreckfish - *Polyprion americanus*

SSR ESTIMATES ARE UNAVAILABLE FOR THE FOLLOWING SPECIES
SPADEFISHES - Ephippidae
Spadefish - *Chaetodipterus faber*

GRUNTS - Pomadasyidae
Black margate - *Anisotremus surinamensis*
Porkfish - *Anisotremus virginicus*
Margate - *Haemulon album*
Tomtate - *Haemulon aurolineatum*
Smallmouth grunt - *Haemulon chrysargyreum*
French grunt - *Haemulon flavolineatum*
Spanish grunt - *Haemulon macrostomum*
Cottonwick - *Haemulon melanurum*
Sailors choice - *Haemulon parrai*
White grunt - *Haemulon plumieri*
Blue striped grunt - *Haemulon sciurus*

TILEFISHES - Malacanthidae
Blueline tilefish* - *Caulolatilus microps*
Tilefish (Golden)* - *Lopholatilus chamaeleonticeps*
Sand tilefish* - *Malacanthus plumieri*

WRASSES - Labridae
Hogfish - *Lachnolaimus maximus*
Puddingwife - *Halichoeres radiatus*

*These species form the deep water grouper fishery.

longline and trap gear in order to catch enough fish to operate profitably. Combined spawning stock ratios (SSRs) show that nine of 19 species have SSR values of less than 0.30; four species have values of from 0.34 to 0.30; 16 of 19 species have SSR values at 0.38 of less; and of the three remaining species, the SSR value for greater amberjack (0.79) is highly suspect because of the unusual distribution of samples sizes (Table 2). Table 2 also shows that the SSRs for a number of species in the commercial sector are above target levels. This is due to the fact that many snapper grouper species stratify by depth, that is to say larger fish are found offshore. Because the commercial fishery mainly operates in deeper waters it catches primarily larger fish and population parameters or SSRs derived from that data subset will be larger. The resource-wide value (commercial and recreational) across all areas resembles weighted averages of all harvests.

Recreational Fishery

Recreational total catches and catch rates, especially for the east coast of Florida, for traditional snapper grouper species, such as red snapper, vermilion snapper and several of the groupers, have declined substantially during the 1980s. In Florida, the declines may have taken place as early as the 1960s, however, data are not available for that period. The average size of vermilion snappers, black sea bass, and groupers are quite small in recreational catches. Part of the reason for the small average size of recreational fish is due to the fact that some species stratify in size by depth. Another equally or more important factor is that total inshore fishing pressure is so high that fish are not allowed to grow to optimum size before capture. As soon as fish reach legal size they are caught. This, of course, is a classical example of growth overfishing. SSRs derived from recreational catches of black sea bass, vermilion snapper, red porgy, red snapper, gag, scamp, red grouper, greater amberjack, snowy, and speckled hind show that these species are overfished (Table 2) and require management.

Status of Stocks

Table 2 shows SSRs, where estimates are available, for key species in the management unit. (See discussion under Amendment 6 for more information on status of the stocks.) An examination of Table 2 shows that many highly prized species in the snapper grouper complex are overfished as indicated by their SSRs. Examples include red snapper, vermilion snapper, black sea bass in the Carolinas and Florida and several groupers. It is also evident that species off Florida are under more fishing pressure than those further north. This coincides with development of the fishery which originated in Florida and expanded northward, particularly in the 1970s. Similarly, the fishery moved offshore during the 1970s and 1980s with tilefish and deep water snappers and groupers

Table 2. Area-Wide SSR values by species with and without minimum sizes (Bold=overfished).

	COUNCIL's OVERFISHED SSR %	PDT/NMFS GOAL SSR%	1990Assessment % w/o minimum size Recreational	Commercial	1990 Assessment % with Minimum Size Recreational	Commercial	1991 Assessment Overall SSR %	SSR% with Minimum Sizes
I. MINIMUM SIZE = 8 (203 MM) Total Length								
Lane snapper	30%	40%	FL=47-50%	NFL = 47%	31%	47%	58%	59%
Black sea bass	30%	30%	Car=15% FL=17-26%	CarHLL=39% CarTRP=40%	30%	47%	34%	48%
II. MINIMUM SIZE = 12 (305 MM) Total Length								
Yellowtail snapper	30%	40%	FL=43-40%	SFL=42%	56%	55%	38%	55%
Gray snapper	30%	30%	FL=56-29%	NFLHL=19%	32%	**25%**	**12%**	**14%**
Mutton snapper	30%	40%	FL=49-47%		49%		38%	44%
Vermilion snapper	30%	30%	Car = 19% FL=26-19%	Car=20-28% FL=17-27%	30%	**25%**	**23%**	**28%**
Red porgy	30%	40%	Car = 18% FL=45-19%	Car = 29%	33%	38%	**11%**	**15%**
Gray triggerfish (Fork Length)	30%	40%	Car = 43% FL=22-18%	Car = 36% NFL=38%	Car = 44% **FL=26-22%**	Car= 39%	30%	
Schoolmaster snapper	30%							
Queen snapper	30%							
Blackfin snapper	30%							
Cubera snapper	30%							
Dog snapper	30%							
Mahogany snapper	30%							
Silk snapper	30%							
III. MINIMUM SIZE = 20 (508 MM) Total Length								
Red snapper	30%	40%	Car = 15% NFL = 5%	Car=24% FL=17-55%	33%	40%	**8%**	34%
Gag	30%	40%	Car =19%	Car =47%	30%	67%	32%	34%

Table 2. Continued

	COUNCIL's OVERFISHED SSR %	PDT/NMFS GOAL SSR%	1990Assessment % w/o minimum size Recreational	Commercial	1990 Assessment % with Minimum Size Recreational	Commercial	1991 Assessment Overall SSR %	SSR% with Minimum Sizes
Scamp(Fork Length)	30%	40%	FL=32-30% Car = 18% NFL=42%	FL=54-56% Car = 28% NFL=49%	Car =42% FL=74%	Car=50% NFL=60%	**28%**	42%
Red grouper	30%	40%	Car = 24% FL=11-28%	Car=34% SFLTRP15% SFLHLL=45%	FL=51-62%	FL =37%	41%	50%
Black grouper	30%	40%	SFL = 40%	NFL=45%	43%	50%	37%	42%
Yellowfin grouper	30%							
Yellowmouth grouper	30%							
IV. MINIMUM SIZE = 28 (711 MM) Fork Length								
Greater amberjack	30%	40%	Car = 17% NFL = 18%	27%	**27%**	43%	79%	
V. NO RETENTION								
Nassau grouper	30%	40%						
Speckled hind	30%	40%	Car = 22% SFL = 48%	Car = 37% FL=42-45%			**25%**	
Snowy grouper	30%	40%	Car = 10%	Car = 15% FL=36-40%			**15%**	
Warsaw grouper	30%	40%		12%			**0.2%**	
Misty grouper	30%							
Yellowedge grouper	30%							
Golden tilefish	30%	40%		Car=35% NFL=28%;SFL=42%			31%	

"Abbreviations: FL=Florida; Car=Carolinas; NFL=North Florida; SFL=South Florida, HLL=hook&line,longline; TRP=traps"

being subjected to increased fishing pressure.

Presently, thirteen species (described earlier) are in a documented state of overfishing. Fifteen other species are thought to be overfished. Recreational fishing pressure will likely continue to increase as the coastal population continues to grow in the South Atlantic.

The virtual absence of larger fish in the nearshore waters of the management unit as well as the shifting of target species by both recreational and commercial sectors are other indicators that many, especially the highly prized, traditional species (red snapper, gag, scamp, etc.) are under intense fishing pressure and require management.

Optimum Yield (SAFMC, 1990b)

Optimum yield (OY) is any harvest level for a species which maintains, or is expected to maintain, over time, a survival rate of biomass into the stock of spawning age fish to achieve at least a 30% spawning stock biomass per recruit (SSBR) population level, relative to the SSBR that would occur with no fishing.

Definition of Overfishing (SAFMC, 1990b)

Overfishing for all species other than jewfish is defined as follows:

1. A snapper grouper stock or stock complex is overfished when it is below the level of 30% of the spawning stock biomass per recruit which would occur in the absence of fishing.

2. When a snapper grouper stock or stock complex is overfished, overfishing is defined as harvesting at a rate that is not consistent with a program that has been established to rebuild the stock or stock complex to the 30% spawning stock biomass per recruit level.

3. When a snapper grouper stock or stock complex is not overfished, overfishing is defined as a harvesting rate that, if continued, would lead to a state of the stock or stock complex that would not at least allow a harvest of OY on a continuing basis.

FUTURE AMENDMENTS

Amendment 6

The original snapper grouper fishery management plan (SAFMC, 1983a) established a management program for the snapper grouper resource in the South Atlantic which included minimum sizes for six species identified as being overfished at that time. In addition to various gear restrictions, a process for evaluating growth overfishing of other species was specified as Management Measure 1 and the procedure for implementing minimum sizes (regulatory amendment) was specified as Management Measure 2. Management Measure 18 specified the statistical reporting and data collection necessary to evaluate the status of species in the management unit. Research needed to refine the

management program was also identified.

The first assessment of the status of species in the snapper grouper fishery was prepared by the National Marine Fisheries Service, Beaufort, North Carolina, with input from the South Atlantic Council's Plan Development Team (PDT), and presented to the Council in August 1990. This assessment became the basis for Amendment 4 (SAFMC, 1991a).

The 1991 assessment prepared by the National Marine Fisheries Service was presented to the Council in June 1991 and consisted of the following: (1) Survival of released reef fish: A summary of available data (Parker, 1991); (2) The relationship between spawning season and landings of selected reef fishes (Burton, 1991); and (3) South Atlantic snapper grouper assessment 1991 (NMFS, 1991). This assessment confirmed the status of the stocks as indicated in the 1990 report and represents the biological information supporting Amendment 6. The 1991 assessment concluded that:

> For most species, overall regional estimates of SSR and present Y/R predominantly reflect values resulting from recreational fishing as reported in the 1990 assessment. The estimates are of course affected more by numbers of fish caught than by weight caught and given that recreational fisheries, by and large, take smaller fish of a species, a recreational fishery of less poundage than a simultaneous commercial fishery can influence SSR and Y/R values more. In particular, inclusion of the MRFSS data, with the associated very large, non-headboat recreational catches, often had a dramatic effect on region wide estimates of SBR.
>
> Overall, nine of nineteen species have SSR values of less than 0.30, the criterion value designating overfishing. Another four species have values of from 0.34 to 0.30, very close to the criterion level, while sixteen of nineteen species have SSR values at 0.38 or less. Of the remaining three species the SSR value for greater amberjack, 0.79, is highly suspect because of the unusual distribution of samples sizes.
>
> We realize that there are variances associated with these estimates and that in truth an estimate of 0.28 may not be different than one of 0.30, or for that matter, 0.35. Indeed the true SSR value for some species that appear "safe" (SSR >0.30) may actually be less than 0.30. However, given ignorance of the variances we have no choice but to use the point estimates with caution.
>
> To provide a further overview of the snapper-grouper resource we computed weighted (both by number caught and weight caught) average SSR values for the group as a whole. While these values have limited predictive value and probably cannot be interpreted precisely, we believe they provide a useful general guide to the state of the

resource. Weighted by number (and excluding values pertaining to greater amberjack) or weight caught the overall SSR is 0.28. Relative to the Council's minimum acceptable state both are clearly indicative of the depressed condition of the resource as a whole.

Finally, as is mentioned several times in subsequent text, the projected value of size limits is based on the assumption that survival of released undersize fish is complete. As mortality of released fish increases, the effect of the size limit in increasing SSR diminishes. The diminution could be offset by a still greater size limit which in turn would have to be adjusted to account for the longer period of the fish's life when it is too small for legal retention and subject to mortality upon release. Ultimately if release mortality is too high (the exact situation varies by species and levels of fishing mortality), SSR can only be increased by reducing fishing mortality.

The level of overfishing and need for management are supported by the 1990 conclusions of the NMFS/Plan Development Team wherein, based on the overfished status of many species in the management unit, they recommended establishment of reef fish reserves equal in area to 20% of the "live bottom" along the southeastern United States in conjunction with the 20% spawning stock ratio. If the level of spawning stock ratio was increased or decreased, then the corresponding percentage of area in the reserve would change accordingly.

In addition to the serious problem of overfishing, the Council is also concerned about the impact of fishing gag during spawning periods, the impact of fishing mortality on the genetics of exploited fish populations, the impacts of various gear types and their development (allowable gear), and the economics of fisheries for amberjacks and the deep water complex as reflected by limited entry problems 1 through 6 in Amendment 5.

The Council is taking the actions described in this amendment to reduce fishing mortality on overfished species and thereby prevent overfishing; protect the genetic composition of exploited fish populations, and preserve the economics of fisheries for amberjacks and the deep water complex.

New Problem

Localized overfishing and depletion. The Council is concerned that in certain situations (*e.g.*, groupers in Monroe County, Florida) fishing mortality reduces abundance in a localized area which negatively impacts fishing for a period of time.

New Objective

Evaluate and minimize localized overfishing.

Management Measures

The items being addressed in Amendments 6 through 8 represent items deferred from Amendment 4 (management of the deep water complex, quota management for the deep water complex, limited entry for the deep water complex, gag spawning closure, specify allowable gear, and experimental gear), items deferred early in development of Amendment 4 (marine fishery reserves), and other options (dealer permits, permit sanctions, and a moratorium on commercial permits for the entire snapper grouper fishery with a 5-year sunset).

Gag Spawning Closure. Bohnsack (1989) summarized information relevant to the management strategy of protecting grouper spawning aggregations (Amendment 4, Appendix 2). The information presented would be applicable to any species that forms spawning aggregations:

> ...Polovina and Ralston (1987, pg 394) noted that groupers may be especially vulnerable to overexploitation because of their tendency to aggregate at traditional spawning sites and their protogynous reproductive system. A concern exists that this concentrated fishing activity exacerbates overfishing problems. Spawning aggregations have shown signs of overfishing in the Virgin Islands (Olsen and LaPlace, 1978). Evidence exists that fishing mortality can reduce or annihilate known spawning aggregations...A suggested remedy is to protect these spawning aggregations from all fishing activities...Altering catchability is a recognized management technique. Clearly, protecting spawning aggregations would reduce catchability. Spawning aggregations increase catchability (portion of the stock removed by one unit of fishing effort) by increasing fish concentration in defined areas at predictable times. Some evidence shows that in addition to concentrating grouper, grouper may be less cautious and more vulnerable to fishing gear. Johannes (1981) reported that grouper tended to be more lethargic during mass spawning aggregations and could be more easily approached by spearfishermen...Another concern is based on the fact that larger fishes (males) tend to be more aggressive and less cautious in taking baits and entering traps (Thompson and Munro 1974; 1983; pg 651, Munro 1987)...Kapuscinski and Philipp (1988) noted that harvest regulations during spawning seasons help maintain the genetic diversity within stocks...In conclusion, management actions to limit or prohibit fishing of spawning aggregations appears justified and prudent. Grouper populations in the Virgin Islands and Puerto Rico show signs of overfishing. Spawning stocks are targeted and particularly vulnerable to exploitation by a variety of fishing gear types during mass spawning aggregations.

Particular spawning aggregations have disappeared or show signs of overexploitation due to fishing activities. Evidence exists that reef fish stocks are recruitment limited and recruitment success becomes increasingly uncertain with reduced stock size.

The Council considered prohibiting the harvest and/or landing of gag in excess of the grouper aggregate bag limit of five (excluding Nassau grouper and jewfish) in or from the entire EEZ or south of Cape Canaveral, Florida (Vehicle Assembly Building, 28° 35.1' N Latitude) during December, January, and/or February. This measure would not preclude commercial fishing during this time as long as the harvest did not exceed the bag limit. The spawning closure would provide additional biological protection above that provided by the approved bag limit and size limits.

The Council is concerned about the high catch rates from spawning aggregations. Gag spawn in the winter with peak spawning in February off the Carolinas (Manooch and Haimovici, 1978 from Burton, 1991) and in the Gulf of Mexico gag spawned from January through March (McErlean, 1963 from Burton, 1991). Burton (1991) has observed gag in spawning condition in northeast Florida from December through February. Gag are densely aggregated and very aggressive during the spawning period making them especially vulnerable to fishing at this time. Since the commercial fishery is not currently constrained by a quota, a commercial closure during the spawning period will help prevent an excessive harvest and resultant increase in fishing mortality from occurring. Excessive harvest when fish are so vulnerable might result in increases in fishing mortality sufficient to require implementation of quotas or other measures to constrain the commercial fishery. Spawning area closures may preclude the need for further measures.

This measure would reduce fishing mortality by approximately 7% to 10% per month based on mean percent of 1982-1990 North and South Carolina and 1986-1990 Florida landings assuming most gag landed during this time period were associated with spawning aggregations. It would have been the Council's intent that gag caught legally under the bag limit during the spawning closure may be sold in conformance with state law and the commercial size limit.

The Council has, in the past, allowed harvest up to the recreational bag limit to promote public understanding of and compliance with the bag limit regulations. Changing the bag limit to zero for a time period would have limited biological benefits and created significant negative public and enforcement costs. There is equity in leaving the recreational fishery open during the spawning closure in that the commercial fishery is not limited by a quota while the recreational fishery operates under a five-fish bag limit.

The Council concluded that the information available did not justify a region-wide closure and was concerned that if necessary in the future, that the

bag limit of five-groupers would be to high. This measure will be evaluated for future action and the Council has requested the State of Florida to investigate the high gag catches in state waters during the winter. If Council action is warranted in the future, a lower bag limit or total closure will be considered.

Specify Allowable Gear. The following gear represent the only gear allowable in the snapper grouper fishery:

- Hand-held hook-and-line gear - includes manual, electric, or hydraulic rod and reels whether attached to the vessel or hand-held.
- Spearfishing gear - includes powerheads (any device with an explosive charge, usually attached to a speargun, spear, pole, or stick, which fires a projectile upon contact) except where explicitly prohibited (*e.g.*, special management zones) but does not include the use of mechanically operated underwater sleds or scooters.
- Bottom longline - this gear is allowed only in waters deeper than 50 fathoms, only for species other than wreckfish, and only north of Cape Canaveral.
- Black sea bass traps.

The types of gear listed above are the only gear types allowed in the fishery; all other gear types are prohibited. This action provides a mechanism for experimental gear to be evaluated. The Council's attempts to manage fisheries provide numerous examples of new gear that has been developed and had negative impacts on the fishery: (a) trawl gear in the snapper grouper fishery; (b) fish traps, entanglement nets, and bottom longlines in the snapper grouper fishery; (c) drift gill nets in the mackerel fishery; (d) purse seines and run-around gillnets in the mackerel fishery; and (e) drift gill nets and pair trawls in the swordfish fishery.

Experimental Gear. The Regional Director may issue permits for experimental gear on a limited basis provided that a process is implemented to collect data on the use of the particular gear concurrently with issuance of the permit. The Regional Director will advise the Council upon issuance of a permit.

The data collected would be reviewed by the assessment review group as soon as possible after the gear has been in use for twelve months or some specified period of time, however, the permit could be revoked at any time if the situation warranted. The permittee may be required to carry an observer at the permittee's expense. The Council would review the data and the group's report and determine whether the gear should be allowed. Any changes would be made by plan amendment. It would be the Council's intent to allow sale of the catch from experimental gear. The law enforcement committee recommended a consistent policy to allow the sale of fish from experimental gear.

Dealer Permits. The Council will require all dealers who want to handle species in the management unit to obtain a federal dealer permit. Dealers who handle these fish must fill out monthly reports listing their total fish purchases

and must attach their portions of the coupons only for those species under ITQ management. Requirements for a federal dealer permit are that the applicant possess a state dealer's license, and that the applicant must have a physical facility at a fixed location in the state wherein the dealer has a state dealers license. A fee will be charged to cover the administrative costs of issuing federal dealer permits. To purchase fish from fishermen, a person or business must have a federal dealer permit.

Dealer permits should increase compliance with individual quota management. Landings in excess of individual quotas still remains an important concern for limited entry. Dealer permits should increase our ability to track individual quotas accurately and provide inducements for dealers to report quota busting infractions. Because dealers will be required to send in monthly reports as part of the tracking system for individual quotas, requiring a permit will give management something that can be revoked for serious non-reporting incidents or other infractions. The requirement that dealers have a physical facility in a fixed location will help enforcement officers define the universe of fish houses and other establishments authorized to purchase fish from these fishermen.

Moratorium on Commercial Permits. The Councils have approved establishment of a moratorium on commercial permits (excluding charter and headboats) effective upon the date of publication of the final regulations in the Federal Register, for the entire snapper grouper fishery not to exceed five years, and prior to the expiration of the five-year period the Council may proceed with a limited entry program. Replacement of vessels and sale of permits will be allowed during this time period.

This option would stabilize the number of participants in the fishery while the Council evaluates limited entry in Amendment 7.

Amendment 7 - Management Options

Establish Size Limits. Survival of released fish from the deep water complex is expected to be very low. Thus, establishment of minimum size limits would not result in any reduction in fishing mortality. In fact, fishing mortality and wastage would increase.

Establish an Open Access Quota. A quota management system for the deep water complex would be hard to track with the existing system. Management requirements to track Spanish and king mackerel and wreckfish quotas already result in a significant burden on available resources. The costs involved in tracking such a quota, on a real-time basis, would be high. Open access, quota-only management would not be economically efficient. See limited entry discussion.

• Option 1. The harvest or possession of the following species is prohibited: speckled hind, warsaw grouper, snowy grouper, misty grouper, yellowedge grouper and golden tilefish. Include blueline tilefish and sand tilefish for

enforcement purposes.

This option was recommended by the plan development team/NMFS stock assessment (Amendment 4: Tables 2 and 3). Any of these species that were caught incidentally to other fisheries were to be returned to the water immediately in a manner that minimized injury to the fish. These fish, exclusive of Nassau grouper, form what is known as the deep water grouper fishery and it was the Council's intent that there would have been no fishing targeting these species. The Council had intended to have this prohibition in place for one generation time (approximately twenty years) to allow these species an opportunity to rebuild. A framework procedure is included in the amendment whereby the zero quota and zero bag limit could be changed if the status of the stock improves above the overfishing level. These species will be assessed on a periodic basis.

Speckled hind are present throughout the South Atlantic, but only the Carolinas produced sufficient catch and samples for analysis. Speckled hind attain a weight in excess of 55 lb and live longer than 25 years. The headboat catch declined from about 8,600 fish in 1973 to about 2,000 per year in the 1980s with a 1988 catch of only 1,700. The total catch was probably highest in 1973 when the headboat catch alone was almost 66,000 lb. The 1988 total recreational and commercial catch in the Carolinas was only 28,600 lb. Catch per angler day is only available from the headboat fishery and declined from a high of 0.24 in 1973 to about 0.05 in 1988 in the best speckled hind area. The catch per angler day was only 0.01 over the entire Carolina region in 1988. For the entire Carolina region, mean weight declined from 9.17 lb in 1972 to 4.0 lb in 1988. The headboat fishery SSR is currently 22%, which would require a 24% reduction in F or the size at recruitment would need to be increased to 393 mm (approximately sixteen inches) to get to a 30% SSR. The PDT recommended that: "Given (1) the extraordinary decrease in mean size and abundance; and (2) the inability of bag limits to lower F in the recreational fishery because catching even one fish is extremely rare, the plan team recommends a prohibition on retaining speckled hind with a further provision that incidentally taken fish be released after puncture of any protruding air bladders or stomachs. Because speckled hind are now rare a bag limit would be both insufficient protection and useless."

Warsaw grouper live longer than 40 years and attain weights in excess of 330 lb. They occur from North Carolina to the Dry Tortugas; the majority are taken from the Carolinas through Cape Canaveral, Florida. The Carolina headboat catch peaked at 125 fish in 1976 and decreased to only ten fish in 1987. Total weight declined from 10,340 to 264 lb over the same time. Commercial landings data are problematic due to lumping of groupers. The assessment report noted that: "South Carolina data, separated by species since 1981, shows warsaw landings highest in 1981 with 9,460 lb, bottoming out at

990 lb in 1985, and rising to 2,699 lb in 1989, still a 72% reduction from 1981 levels." Catch per angler has declined as has mean weight, with the Carolina headboat fishery showing a 50% decline from 33 lb in 1981 to 15 lb in 1988. Headboat catch per angler data from South Carolina show a decline from 39.6 lb in 1976 to 8.8 lb in 1987 (75% reduction). All areas combined indicate a SSR of 12% which would require a 60% reduction in F or a minimum size of 41" to get a SSR of 30%. The PDT recommended that: "Warsaw grouper are part of a complex of deep water fish that also includes snowy and yellowedge grouper and gray tilefish. Due to the extreme depths at which these fish are found, management of each species should be similar. The PDT believes the most appropriate goal is a 40% SSBR. To obtain this goal, an extra-ordinarily large reduction in F is needed. The minimum size limit required to accomplish this is very large, and it is doubtful that many released warsaw would survive due to the depth of water where caught. The PDT recommends no-retention regulations for warsaw grouper in order to reduce F to the levels needed to not only rebuild the stock in numbers, but to allow the species to return to its former large average size. This regulation in conjunction with fishery reserves should prevent irreparable damage to the species."

Snowy grouper live more than 25 years and grow to weights in excess of 20 kg (44 lb). The headboat catch increased from about 1,000 fish in the Carolinas in 1972 to a peak of about 2,700 fish in 1980 but then declined to less than 1,000 fish in 1988. South Florida headboat data show a similar trend. The assessment report indicates that: "Commercial landings from 1981-1989 averaged 267,762 lb for NC, SC and GA combined, with the greatest catch 416,209 lb in 1983. Landings then dropped to 155,338 lb in 1985 before rising to 361,438 lb in 1989." Catch per angler data is only available for the headboat fishery and declined from a high of 0.04 fish per angler day for the Carolinas in 1974 to a low of 0.005 fish in 1984 and then remained around 0.01 from 1985-88. In South Florida the headboat catch per angler day remained at or below 0.001 from 1982-88 except in 1983 when it increased to 0.006 which coincides with the year of highest landings. Mean headboat weight in the Carolinas declined from 10.87 lb in 1972 to about 3.5 lb in 1988. In the Florida headboat fishery mean weight declined from 6.4 lb in 1982 to 3.3 lb in 1988. The mean fish weight in the commercial fishery declined from 8.1 lb in 1984 to 3.7 lb in 1989. SSR estimates from the Carolinas were 10% for headboats, 25% for commercial traps and 15% for a commercial "all gear" category. The South Florida commercial data indicate a SSR of 40%. The PDT was concerned about the low mean size and low SSR in the Carolinas and recommended: "(1) a 70% reduction of the commercial catch; (2) a bag limit of one fish per person per day in the recreational fishery to discourage directed harvest but simultaneously to prevent waste of this unreleasable fish; and a requirement that the species be sorted and sold separately in the commercial venue so that accurate records of

landings can be achieved. Given that the snowy grouper is no longer the target of recreational anglers, at least on headboats, we believe that essentially closing the recreational season will have little repercussion."

The golden tilefish catch "reflect alarming declines since 1984 for the Carolinas and since 1982 for Florida. For both areas, the fishery has been productive for a relatively short period of time during the 1972-1989 (Carolina) and 1972-1988 (East Coast of Florida) evaluation period. For the Carolinas (actually SC only), landings increased from about 44,000 lb in 1979 to approximately 638,000 lb in 1982. Catches have declined since then and in 1987 were less than 110,000 lb. Landings for 1988 and 1989 have remained near 154,000 lb. For Florida, landings averaged less than 220,000 lb from 1972-1980, and then increased to about 3,300,000 lb in 1982. Since 1982 catches have declined to approximately 440,000 lb in 1988." The mean fish weight declined from 15.4 lb in 1984 to about 9.7 lb in 1989. The Carolina fishery is producing a SSR of 35% which would require a 13% reduction in F or a minimum size of 570 mm (22.4") to attain a SSR of 40% (SSR of 30% not applicable). In north Florida, the SSR is 28% which would require a 21% reduction in F or a minimum size of 645 mm (25.4") to achieve a 30% SSR. To get a 40% SSR, requires a 41% reduction in F or a minimum size of 704 mm (27.7"). The south Florida commercial fishery is producing a SSR of 42%. The PDT recommends: "the closing of the fishery (moratorium), but allowing an incidental harvest by the commercial fishery for snowy grouper. The South Carolina summary (Appendix) warns that 'there exists a strong possibility of recruitment failure and stock collapse under continued fishery pressure.' The allowable level of incidental catch is to be based on records held by the State of South Carolina." (NOTE: The referenced appendix is a part of the 1990 NMFS/PDT assessment.)

SSR estimates were not available for misty and yellowedge groupers. Misty and yellowedge grouper life history characteristics would likely be similar to the other groupers in this size category.

• Option 2. Establish an area delineated by loran that covers the known distribution of speckled hind, warsaw grouper, snowy grouper, misty grouper, yellowedge grouper and golden tilefish and close it to fishing for species in the snapper grouper fishery for twenty years.

Option 2 is based on the plan development team/NMFS assessment and combines the no retention recommendation and the closed area recommendation.

Establish an Individual Transferable Quota Program. A system of individual transferable quotas provides a mechanism that allows fishermen to fish when it is potentially more profitable, and in the manner that is most profitable. In contrast, under open access and TAC management, a fishing derby is typically created where fishermen are virtually forced to catch fish as fast as

possible as soon as the fishing season opens without regard to prices or fishing costs, in order to get a share of the harvest before the TAC is met. The mechanism to allow fishermen the choice of when to fish is accomplished by dividing TAC into individual quotas that fishermen can harvest anytime during the fishing year, except during the spawning closure. Individual quotas are determined by percentage shares assigned to fishermen during the initial allocation that can be modified by trading among fishermen.

With individual transferable quotas, efficient use of capital and labor can be accomplished because business entities can sell, lease, or purchase portions or all of their shares to adjust to their existing capital holdings and other factors that influence the scale of individual operations. This mechanism has been successfully used in other fisheries around the world to address over-capitalization and to avoid short-run oversupply problems inherent in competitive fishing under open access or license limitation. Over time, free market forces will encourage individual enterprises to minimize their costs of fishing and maximize the value of their catch. Percentage shares should eventually be transferred to enterprises that can fish at the least cost and produce the highest valued product.

Although not widely used to date in the U.S., individual quota based management has been used successfully in New Zealand and Australia to address problems inherent in open access management. Individual transferable quotas are presently being used in the South Atlantic wreckfish fishery, several Great Lakes fisheries, and in the Mid-Atlantic surf clam and ocean quahog fishery.

In addition to addressing short-run oversupply and overcapitalization, individual quotas have been effectively used to create a stable management regime that allows for cost-effective, long-range planning for the harvesting and processing/distribution sectors. In fisheries managed with open access or license limitation, the need for increasingly restrictive management measures under derby fishing can make long-range planning difficult for fishermen and fish house owners because newly purchased gear may not be usable under new regulations, and competitive advantage has a very large influence on the quantity of fish that a fisherman or fish house will handle year to year. This variability in catch per vessel or per fish house can lead to under or overcapacity problems and inefficient use of capital goods such as vessels and unloading/processing facilities. The stability of knowing how much a business entity is likely to harvest on an annual basis with individual quotas allows businesses to undertake long-range planning to minimize production costs and promote efficiency for the scale of the individual share they control.

The Council has concluded to manage the deep water complex by setting individual total allowable catch levels for tilefish and for snowy grouper, and allow the retention of all species caught while fishing for tilefish and snowy

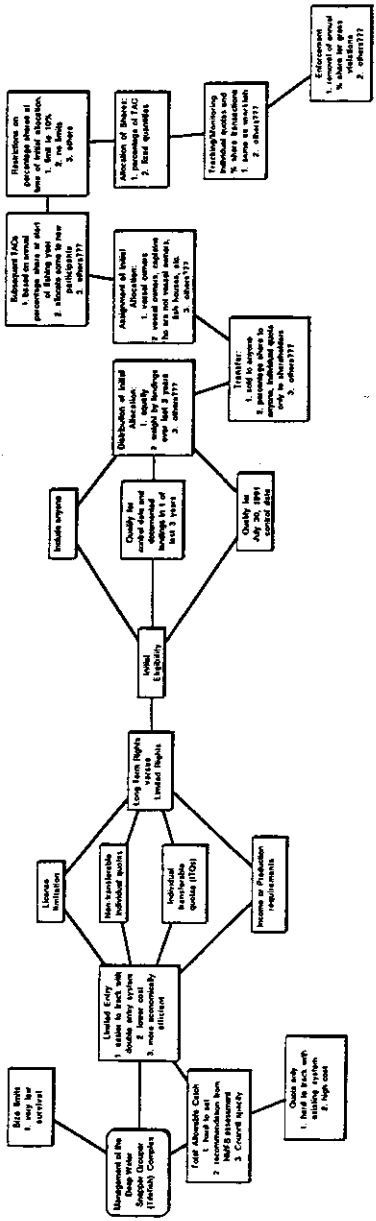

Figure 1. Options for management of the deep water complex of snappers, groupers, and tilefish.

grouper. Once the tilefish and snowy grouper ITQs have been met, then no fishing that would result in a bycatch of these species will be allowed. Figure 1 outlines the steps that will be considered in development of this system.

Amendment 8

The Council's snapper grouper plan development team (a group of experts) recommended the Council establish "marine fishery reserves for 20% of the habitat while other traditional fishery management practices would be applied to the other 80% of the habitat. Scattered marine fishery reserves are to be established throughout the U.S. southern Atlantic region with the goal of protecting a minimum of 20% of the reef fish spawning stock biomass (SSB). To achieve this goal, the PDT recommends including 20% of representative cross sections of the continental shelf as MFRs on the basis that removing 20% of the habitat from fishing protects 20% of the population and 20% of the spawning stock at equilibrium. Ideally, MFR sites will include representative shelf habitats in proportion to their occurrence and their importance to various species. The remaining 80% of the shelf will be managed by any of several traditional options selected by the Council for optimizing yield. Non-consumptive resource use would be allowed in MFRs."

The Council is in the process of reviewing and evaluating this concept and will be cooperating in the development of regulations for the recently established Florida Keys National Marine Sanctuary.

LITERATURE CITED

Bohnsack, J.A. 1989. Protection of grouper spawning aggregations. NMFS Coastal Resources Division, Contrib. No. CRD-88/89-06, NOAA/NMFS Southeast Fisheries Science Center, Miami Laboratory, 75 Virginia Beach Dr., Miami, FL 33149, 8 pp.

Burton, M. 1991. The relationship between spawning season and landings of selected reef fishes.NMFS, Southeast Fisheries Science Center, Beaufort Laboratory, Beaufort, NC 28516-9722. Unpub. ms. 72 pp.

Johannes, R.E. 1981. Words of the Lagoon. University of Calif. Press. Berkeley and Los Angeles, CA. 245 pp.

Kapuscinski, A.R. and D.P. Philipp. 1988. Fisheries genetics: Issues and priorities for research and policy development. *Fisheries* 13(4):4-10.

Manooch, C.S. and M. Haimovici. 1978. Age and growth of the gag, Mycteroperca microlepis, and size-age composition of the recreational catch off the southeastern United States. *Trans. Am. Fish. Soc.* 197(2): 234-240.

McErlean, A.J. 1963. A study of the age and growth of the gag, Mycteroperca microlepis Goode and Bean (Pisces:Serranidae) on the west coast of Florida. *Fla. Board Conserv. Mar. Lab. Tech. Ser.* 41:1-29.

Munro, J.L. 1987. Workshop synthesis and directions for future research. In: Polovina and Ralston (ed.) *Tropical Snappers and Groupers: Biology and Fisheries Management*. Westview Press. Boulder, CO. p. 639-659.

NMFS. 1991. South Atlantic snapper grouper assessment, 1991. NMFS Staff, Southeast Fisheries Science Center, Beaufort Laboratory, Beaufort, NC 28516-9722. Unpub. ms. 66 pp.

Olsen, D.A. and J.A. LaPlace. 1978. A study of a Virgin Islands grouper fishery based on a breeding aggregation. *Proc. Gulf Carib. Fish. Inst.* 31:130-144.

Parker, R.O., Jr. Survival of released fish — A summary of available data. NMFS, Southeast Fisheries Science Center, Beaufort Laboratory, Beaufort, NC 28516-9722. Unpub. ms. 6 pp.

Polovina, J.J. and S. Ralston (eds.). 1987. Tropical Snappers and Groupers: Biology and Fisheries Management. Westview Press. Boulder, CO. 659 pp.

SAFMC. 1983a. South Atlantic Fishery Management Council. Fishery Management Plan, Regulatory Impact Review and Final Environmental Impact Statement for the Snapper Grouper Fishery of the South Atlantic Region. SAFMC, 1 Southpark Circle, Suite 306, Charleston, SC 29407-4699.

SAFMC. 1983b. South Atlantic Fishery Management Council. Source Document for the Snapper Grouper Fishery of the South Atlantic Region. SAFMC, 1 Southpark Circle, Suite 306, Charleston, SC 29407-4699.

SAFMC. 1988. South Atlantic Fishery Management Council. Amendment Number 1 and Environmental Assessment and Regulatory Impact Review to the Fishery Management Plan, for the Snapper Grouper Fishery of the South Atlantic Region. SAFMC, 1 Southpark Circle, Suite 306, Charleston, SC 29407-4699.

SAFMC. 1990a. South Atlantic Fishery Management Council. Amendment 2 (Jewfish), Regulatory Impact Review, Initial Regulatory Flexibility Analysis and Environmental Assessment for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. SAFMC, 1 Southpark Circle, Suite 306, Charleston, SC 29407-4699.

SAFMC. 1990b. South Atlantic Fishery Management Council. Amendment Number 3 (Wreckfish), Regulatory Impact Review, Initial Regulatory Flexibility Analysis and Environmental Assessment for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. SAFMC, 1 Southpark Circle, Suite 306, Charleston, SC 29407-4699.

SAFMC. 1991a. South Atlantic Fishery Management Council. Amendment Number 4, Regulatory Impact Review, Initial Regulatory Flexibility Analysis and Environmental Assessment for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. SAFMC, 1 Southpark Circle, Suite 306, Charleston, SC 29407-4699.

SAFMC. 1991b. South Atlantic Fishery Management Council. Amendment Number 5, Regulatory Impact Review, Initial Regulatory Flexibility Determination and Environmental Assessment for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. SAFMC, 1 Southpark Circle, Suite 306, Charleston, SC 29407-4699.

SAFMC. in prep. South Atlantic Fishery Management Council. Updated Source Document for the Snapper Grouper Fishery of the South Atlantic Region. SAFMC, 1 Southpark Circle, Suite 306, Charleston, SC 29407-4699.

Thompson, R. and J.L. Munro. 1974. The biology, ecology and bionomics of Caribbean reef fishes: Serranidae. *Zool. Dept. Univ. West Indies Res. Rept.* No. 3. 82 pp.

Thompson, R. and J.L. Munro. 1983. The biology, ecology and bionomics of the hinds and groupers, Serranidae. In: J.L. Munro (ed.) *Caribbean coral reef fishery resources*, p. 59-81. *ICLARM Stud. Rev.* 7, Manila.